

Docket No.: 50023-164

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: application of

Tatsumi WATANABE, et al.

Serial No.:

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Group Art Unit:

Filed: January 22, 2002

Examiner:

For: IMAGE PROCESSING METHOD AND IMAGE PROCESSING APPARATUS

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, DC 20231

Sir:

Prior to examination of the above-referenced application, please amend the application as follows:

IN THE SPECIFICATION:

Please amend the specification as follows:

Under "SUMMARY OF THE INVENTION", Page 5, Lines 10 - 20

(Amended) The sequential representative color deciding means repeats from the dividing of an objective group into plural groups through the deciding of the representative color in each of the obtained groups. Then the dividing of an objective group is carried out along with target component selected based on the distribution of the color data in the objective group. And such processing is carried out until a specific number of representative colors are obtained. Therefore, since the approximating of color data is performed corresponding to the distribution of region, it is possible to improve the precision of the approximating. The processing of finding the

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representative color in sequence is performed only for the parts wherein the precision of the approximating cannot be ensured enough by the prepared reference color set, so that the approximating can be performed with high precision and at high speed in general.

Under, "SUMMARY OF THE INVENTION," Page 8, Lines 17-23

(Amended) In this case, each group is subdivided into plural groups based on the distribution of color data in each group obtained by the group dividing means, the iteration of the repeat can be reduced the fewer. Therefore, the approximating can be performed with high precision and at high speed. There is a case where the dividing by the group dividing means is performed only one time due to the dividing by the second group dividing means.

Under, "SUMMARY OF THE INVENTION," Page 9, Lines 13-27 continuing to page 10, Lines 1-4

(Amended) For that, color data statistic calculating means calculates statistic distribution of the color data in the small region. Settled representative color use judging means judges, by comparing the statistic distribution of the color data and statistic distribution obtained from an extracted-from region from which the representative color has been extracted, whether the representative color in the extracted-from region is used or not. Similar region deciding means selects the extracted-from region having the maximum similarity to the small region. The color data classifying means divides the color data in the small region into a specific number of groups based on the distribution of color data in the small region and the representative color in the selected extracted-from region. Simplified representative extracting means extracts a representative color of the color data in the each group obtained by the color data classifying means. In case where the settled representative color use judging means determined that the representative color in the extracted-from region is used, the color data in each small region is approximated by using a specific number of representative colors obtained by the simplified representative color extracting means instead of the representative color deciding means.

Under, "BRIEF DESCRIPTION OF THE DRAWINGS," Page 13, Lines 15-17

(Amended) Fig. 22 is a conceptual diagram showing the image information obtained by a graded coding retaining means of the image processor in the seventh embodiment of the

invention.

Under, "DESCRIPTION OF THE PREFERRED EMBODIMENTS," Page 20, Lines 1-4

(Amended) When S reaches temporary parameter tnum, it is judged whether num reaches the representative color number c_num determined in advance (S9). Then if does not reach, S=1 and tnum=num is set. And the steps from Step S2 are executed. Such termination judgment is executed by the termination judging means 26.

Under, "DESCRIPTION OF THE PREFERRED EMBODIMENTS," Page 20, Lines 5-27, continuing to page 21, lines 1-7

(Amended) A specific number c_num of representative colors extracted by the above processing are retained together with the position information indicating which representative color should approximate color data of a pixel in the block. And by utilizing the retained information, the objective region approximating means 27 in the approximating and restoring end restores the pixel data in each block region (S10). The position information (i, j) corresponds to the pixel coordinates (i, j) in the objective block. The representative color embedded in this position information coordinates is embedded in the corresponding pixel coordinates, thereby the restored image is prepared and the output image 28 can be obtained. Besides, the embodiments explained about an example that the dividing objective group S is divided into four, but it is possible to consider the method of dividing only in the direction of the axis Amax1 with the maximum variance (the dividing into two pieces). In such case, it is expected that the extracting precision of representative color can be improved more than in case of the dividing into 4 pieces, and it is possible to ensure the high precision of the output image finally obtained. However, since the iteration of the processing increases for the sequential dividing, the processing speed is delayed a little. In addition, the dividing objective group can be divided into 8 pieces. In this case, it is possible to skip the processing of the variance per component calculating means 32 and the dividing component deciding means 33, and the extracting of representative colors can be performed at high speed. However, since there is a great possibility of deteriorating the extracting precision, it may be also considered that means for controlling the number to divide the dividing objective group according to the purpose can be added. Likewise, it can be considered that after finding the color data distribution in the objective block region, the number

to divide the objective group be controlled based on the fluctuation of the distribution.

Under, "DESCRIPTION OF THE PREFERRED EMBODIMENTS," Page 26, Lines 11-12

(Amended) Equation 3:

$$b_thres_m = \sum \sum \|eRlt_m - dRlt_m\|^2 / n$$

IN THE CLAIMS

Please amend claim 19 as follows:

19. (Amended) An image processor comprising:

region dividing means for dividing an input image into plural small regions;

initializing means for setting an initial group for the small region and classifying all color data in the small region to the initial group and calculating a representative color of the initial group;

target component selecting means for selecting a dividing target component to be targeted at the dividing of an object group based on distribution of the color data in the objective group;

group dividing means for dividing the objective group into plural groups according to the obtained divided target component and classifying the color data in the objective group to the groups obtained after the dividing;

second group dividing means for subdividing each group into plural groups based on the distribution of color data in each group obtained by the above group dividing means and classifying the color data in each group into groups obtained after the dividing;

representative color extracting means for finding the representative color of the color data in each group obtained by the second group dividing means;

termination judging means for judging whether a specific number of the representative color are obtained or not; and

objective region approximating means for approximating, in case where, after repeating the selecting of the dividing target components by the target component selecting means, the group dividing by the group dividing means and by the second group dividing means, and the representative color extracting by the representative color extracting means, the termination judging means judges that a specific number of representative colors are obtained, the color data

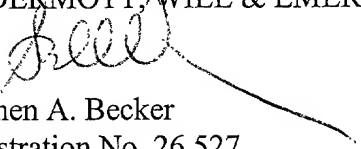
in the small region by using a specific number of the obtained representative colors.

REMARKS

The above-referenced application is amended to correct typographical errors in the specification and claim 19. Attached hereto is the marked-up version of the changes made tot the specification and claim 19. Entry of this Preliminary Amendment is respectfully requested.

Respectfully submitted,

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MARKED-UP VERSION OF SPECIFICATION AND CLAIM 19

IN THE SPECIFICATION:

Please amend the specification as follows:

Under "SUMMARY OF THE INVENTION", Page 5, Lines 10 - 20

(Amended) The sequential representative color deciding means repeats from the dividing of an objective group into plural groups [based on a criterion regarding the dividing target component selected] through the deciding of the representative color in each of the obtained groups. Then the dividing of an objective group is carried out along with target component selected based on the distribution of the color data in the objective group. And such processing is carried out until a specific number of representative colors are obtained. Therefore, since the approximating of color data is performed corresponding to the [objective] distribution of region, it is possible to improve the precision of the approximating. The processing of finding the representative color in sequence is performed only for the parts wherein the precision of the approximating cannot be ensured enough by the prepared reference color set, so that the approximating can be performed with high precision and at high speed in general.

Under, "SUMMARY OF THE INVENTION," Page 8, Lines 17-23

(Amended) In this case, each group is subdivided into plural groups based on the distribution of color data in each group obtained by the group dividing means, the iteration of the repeat can be reduced the fewer. Therefore, the approximating can be performed with high precision and at high speed. There is a case where the dividing by the group dividing means is performed only one time due to the dividing by the second group dividing means.

Under, "SUMMARY OF THE INVENTION," Page 9, Lines 13-27 continuing to page 10, Lines 1-4

(Amended) For that, color data statistic calculating means calculates statistic distribution of the color data in the small region. Settled representative color use judging means judges, by comparing the statistic distribution of the color data and statistic distribution obtained from an extracted-from region from which the representative color has been extracted, whether the representative color in the extracted-from region is used or not. Similar region deciding means selects the extracted-from region having the maximum similarity to the small region. The color data classifying means divides the color data in the small region into a specific number of groups based on the distribution of color data in the small region and the representative color in the selected extracted-from region. Simplified representative extracting means extracts a representative color of the color data in the each group obtained by the color data classifying means. In case where the settled representative color use judging means determined that the representative color in the extracted-from region is used, the color data in each small region is approximated by using a specific number of representative colors obtained by the simplified representative color extracting means instead of the representative color deciding means.

Under, "BRIEF DESCRIPTION OF THE DRAWINGS," Page 13, Lines 15-17

(Amended) Fig. 22 is a conceptual diagram showing the [retained] image information [retained in] obtained by a graded coding retaining means of the image processor in the seventh embodiment of the invention.

Under, "DESCRIPTION OF THE PREFERRED EMBODIMENTS," Page 20, Lines 1-4

(Amended) [After judging] When S reaches temporary parameter tnum, it is judged whether num reaches the representative color number c_num determined in advance (S9)[,] . Then if does not reach, S=1 and tnum=num is set. And the steps from Step S2 are executed. Such termination judgment is executed by the termination judging means 26.

Under, "DESCRIPTION OF THE PREFERRED EMBODIMENTS," Page 20, Lines 5-27,
continuing to page 21, lines 1-7

(Amended) A specific number c_num of representative colors extracted by the above processing are retained together with the position information indicating which representative color should approximate color data of a pixel in the block. And by utilizing the retained information, the objective region approximating means 27 in the approximating and restoring end restores the pixel data in each block region (S10). The position information (i, j) corresponds to the pixel coordinates (i, j) in the objective block. The representative color embedded in this position information coordinates is embedded in the corresponding pixel coordinates, thereby the [approximate] restored image is prepared and the output image 28 can be obtained. Besides, the embodiments explained about an example that the dividing objective group S is divided into four, but it is possible to consider the method of dividing only in the direction of the axis A_{max1} with the maximum variance (the dividing into two pieces). In such case, it is expected that the extracting precision of representative color can be improved more than in case of the dividing into 4 pieces, and it is possible to ensure the high precision of the output image finally obtained. However, since the iteration of the processing increases for the sequential dividing, the processing speed is delayed a little. In addition, the dividing objective group can be divided into 8 pieces. In this case, it is possible to skip the processing of the variance per component calculating means 32 and the dividing component deciding means 33, and the extracting of representative colors can be performed at high speed. However, since there is a great possibility of deteriorating the extracting precision, it may be also considered that means for controlling the number to divide the dividing objective group according to the purpose can be added. Likewise, it can be considered that after finding the color data distribution in the objective block region, the number to divide the objective group be controlled based on the fluctuation of the distribution.

Under, "DESCRIPTION OF THE PREFERRED EMBODIMENTS," Page 26, Lines 11-12

(Amended) Equation 3:

$$\underline{b_thres_m = \sum \sum \|eRlt_m - dRlt_m\|^2 / n}$$

IN THE CLAIMS

Please amend the claim 19 as follows:

19. (Amended) An image processor comprising:

region dividing means for dividing an input image into plural small regions;

initializing means for setting an initial group for the small region and classifying all color data in the small region to the initial group and calculating a representative color of the initial group;

target component selecting means for selecting a dividing target component to be targeted at the dividing of an object group based on distribution of the color data in the objective group;

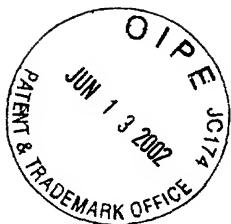
group dividing means for dividing the objective group into plural groups according to the obtained divided target component and classifying the color data in the objective group to the groups obtained after the dividing;

second group dividing means for subdividing each group into plural groups based on the distribution of color data in each group obtained by the above group dividing means and classifying the color data in each group into groups obtained after the dividing;

representative color extracting means for finding the representative color of the color data in each group obtained by the second group dividing means;

termination judging means for judging whether a specific number of the representative color are obtained or not; and

objective region approximating means for approximating, in case where, after repeating the selecting of the dividing target components by the target component selecting means, the group dividing by the group dividing means and by the second group dividing means, and the representative color extracting by the representative color extracting means, the termination judging means judges that a specific number of representative colors are obtained, the color data in the small region by using a specific number of the obtained representative colors.



VERIFICATION OF TRANSLATION


I do hereby solemnly and sincerely declare as follows:

1. That I have a competent knowledge of the English and Japanese Languages.
2. That the attached document entitled:

“IMAGE PROCESSING METHOD AND IMAGE PROCESSOR”

is a true and correct translation in English of a United States Patent Application
serial No. 10/051,124 filed on January 22, 2002.

DATED This 4th day of June 2002.


Akira Kawaguchi
Translator

10051124-061302